

REMARKS

Claims 1 through 4, 6 through 12, 14 through 29, 31 through 37 and 39 through 45 are currently pending in the application.

Claims 7, 21, 23 and 32 are withdrawn.

Claims 5, 13, 30 and 38 are canceled.

This amendment is in response to the final Office Action of June 15, 2004.

Information Disclosure Statement(s)

Applicants note the filing of an Information Disclosure Statement herein on May 21, 2004 and note that a copy of the PTO-1449 was not returned with the outstanding Office Action. Applicants respectfully request that the information cited on the PTO-1449 be made of record herein.

35 U.S.C. § 112 Claim Rejections

Claims 1 through 4, 6, 8 through 12, 14 through 20, 22, 24 through 29, 31, 33 through 37 and 39 through 45 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Applicants respectfully disagree with the Examiner's assertion that the limitation "reduced inductance" in claim 1 is a "vague relative term of degree for which the disclosure provides no clear standard for measuring the degree..." (Office Action, pg. 2.) An Examiner "should allow claims which define the patentable subject matter with a reasonable degree of particularity and distinctness. *Some latitude in the manner of expression and the aptness of terms should be permitted.*" M.P.E.P. §2173.02 (emphasis added). "When a term of degree is presented in a claim, first a determination is to be made as to whether the specification provides some standard for measuring that degree." M.P.E.P. §2173.05(b). The specification states that the inductance is reduced from that of conventional, electrically isolated heat sinks and provides several comparisons of the reduced inductance realized through the practice of the invention. (Application, pg. 11.) Furthermore, given the disclosure in the specification, a person having

ordinary skill in the art “would be...reasonably apprised of the scope of the invention.” M.P.E.P. §2173.05(b). Therefore, the specification “provides some standard for measuring the degree” of the inductance of the claimed inventions.

However, independent claims 1, 22, 24, and 25 have been amended such that the claimed inventions of clearly state that “an electrically conductive heat sink . . . the heat sink coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a signal plane and a ground plane for the plurality of leads of the lead frame for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink”. Applicants assert that such a provision clearly complies with the provisions of 35 U.S.C. § 112. Therefore, claims 1 through 4, 6, 8 through 12, 14 through 20, 22, 24 through 29, 31, 33 through 37 and 39 through 45 are allowable.

35 U.S.C. § 102(b) Anticipation Rejections/35 U.S.C. § 103(a) Obviousness Rejections

Anticipation Rejection Based on Marrs (U.S. Patent 5,701,034) or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Marrs (U.S. Patent 5,701,034)

Claims 1, 2, 4, 6, 8 through 12, 14 through 20, 24 through 27, 29, 31, 33 through 37 and 39 through 45 are rejected under 35 U.S.C. § 102(b) as being anticipated by Marrs (U.S. Patent 5,701,034) or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Marrs.

Applicants assert that a claim is anticipated *only if each and every element* as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Marrs describes or teaches or suggests a packaged integrated circuit including a heat sink with a *locking moat*. (Col. 5, lines 1-3.) A semiconductor die is attached to a surface of a heat sink using adhesive. (Col. 5, lines 6-8.) Package leads are attached to the heat sink also using adhesive. (Col. 5, lines 15-16.) Using conventional bond wiring methods the bond wires are extended between the bond pads on the semiconductor die and the heat sink. (Col. 5, lines 18-

24.) The die, heat sink, bond wires and inner portions of package leads are encapsulated by molding in encapsulant. (Col. 5, lines 24-28.) The encapsulant fills in the locking moat formed in the heat sink and becomes interlocked with the heat sink. (Col. 5, lines 29-32). Additionally, Marrs describes or teaches or suggests a packaged semiconductor die or dice including a heat sink with a locking feature that can be used to support one or more generally conductive *layers thereon and insulated from the heat sink to provide a ground plane or planes, power plane or planes, or signal routing*. (See FIG. 4, Col. 4, Lines 10-13.)

By way of contrast to Marrs, the embodiment of the invention set forth in claim 1 recites elements of the invention calling for an integrated circuit package comprising “a package body; an integrated circuit die positioned within the package body; a lead frame including a plurality of leads having portions enclosed within the package body” and “an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body and with a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink, the heat sink coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a signal plane and a ground plane for the plurality of leads of the lead frame* for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink.”

Marrs does not describe either explicitly or inherently “a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink projecting away from the first portion of the heat sink.” Marrs describes a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs describes a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither expressly nor inherently describes a second portion projecting away from the first portion of the heat sink. Marrs’ description of a locking moat region is in *direct contrast*

with Applicants' invention of a heat sink with "a second portion ...projecting away from the first portion of the heat sink," which "locks the heat sink 28 firmly in place" within the package body. (Application, pg. 9.) The Applicants' invention locks the package body to the heat sink in an entirely different manner than Marrs' invention. Thus, Marrs does not identically describe the elements of Applicants' presently claimed inventions of previously amended independent claim 1.

Furthermore, Marrs fails to describe, either expressly or inherently, a "heat sink coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a single plane and a ground plane." Marrs' description sets forth that the packaged integrated circuit 200 may be placed on a conductive layer 206, which is sandwiched in between dielectric layers 204 and 208, which are formed around the periphery of the die 101. (Col. 5, lines 34-42.) The Applicants' invention incorporates a conductive or ground plane property *into the heat sink itself*, not the underlying substrate, for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink. Thus, Marrs does not identically describe the elements of Applicants' presently claimed inventions of presently amended independent claim 1.

As Marrs fails to expressly or inherently identically describe every element of claim 1, Applicants submit that claim 1 is not anticipated by Marrs under 35 U.S.C. § 102.

Claims 2, 4, 6, 8 through 12, 14 through 20 are allowable as either directly or indirectly from allowable claim 1.

Similarly, Applicants assert that Marrs does identically describe the element of the presently claimed invention of presently amended independent claim 22 calling for "an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body forming an area and having a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink and the integrated circuit die* for having a

different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink.”

Marrs does not describe either explicitly or inherently “a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink projecting away from the first portion of the heat sink.” Marrs describes a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs describes a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither expressly nor inherently describes a second portion projecting away from the first portion of the heat sink. Marrs’ description of a locking moat region is in *direct contrast* with Applicants’ invention of a heat sink with “a second portion ...projecting away from the first portion of the heat sink,” which “locks the heat sink 28 firmly in place” within the package body. Application, pg. 9; the Applicants’ invention locks the package body to the heat sink in an entirely different manner than Marrs’ invention. Thus, Marrs does not identically describe the elements of Applicants’ presently claimed inventions of previously amended independent claim 22, which is therefore allowable.

Independent claim 24 is allowable as Marrs does not describe “a vertically extending columnar portion surrounded by a horizontally extending skirt portion.” Marrs describes a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs describes a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither expressly nor inherently describes “a vertically extending columnar portion surrounded by a horizontally extending skirt portion.” Rather, the heat sink in Marrs does not vary in thickness. (FIGS. 1, 2A, 2B, 4, 8.) Marrs’ description of a locking moat region is in *direct contrast* with Applicants’ invention of a heat sink with “a vertically extending columnar portion surrounded by a horizontally extending skirt portion,” which “locks the heat sink 88 firmly in place” within the package body. (Application, pg. 13.) The Applicants’ invention locks the package body to the heat sink in an entirely different manner than Marrs’ invention. Since Marrs fails to identically describe, either expressly or inherently, each and

every element of previously amended independent claim 24, Applicants respectfully submits that claim 24 is not anticipated by Marrs under 35 U.S.C. § 102.

Independent claim 25 is allowable as Marrs does not identically describe, either expressly or inherently “an electrically conductive heat sink positioned having a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of an enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame and with a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink, the heat sink coupled to one of a signal voltage and a reference voltage for the heat sink to operate respectively as a signal plane and a ground plane* for the plurality of leads of the lead frame for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink.”

Marrs does not describe either explicitly or inherently “a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink projecting away from the first portion of the heat sink.” Marrs describes a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs describes a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither expressly nor inherently describes a second portion projecting away from the first portion of the heat sink. Marrs’ description of a locking moat region is in *direct contrast* with Applicants’ invention of a heat sink with “a second portion ...projecting away from the first portion of the heat sink,” which “locks the heat sink **28** firmly in place” within the package body. Application, pg. 9; the Applicants’ invention locks the package body to the heat sink in an entirely different manner than Marrs’ invention. Thus, Marrs does not identically describe the elements of Applicants’ presently claimed inventions of previously amended independent claim 25.

Furthermore, Marrs fails to describe, either expressly or inherently, a “heat sink coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a single

plan and a ground plane.” Marrs describes that the packaged integrated circuit 200 may be placed on a conductive layer 206, which is sandwiched in between dielectric layers 204 and 208, which are formed around the periphery of the die 101. (Col. 5, lines 34-42.) The Applicants’ invention incorporates a conductive or ground plane property *into the heat sink itself*, not the underlying substrate, for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink.

Marrs fails to identically describe the Applicants presently claimed invention having a conductive or ground plane property *in the heat sink itself*, not the underlying substrate for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink. Since Marrs fails to identically describe each and every element of claim 25, Applicants respectfully submit that claim 25 is not anticipated by Marrs under 35 U.S.C. § 102.

Applicants assert that claims 26 through 29, 31, 33 through 37, 39 through 45 are each allowable as depending either directly or indirectly from allowable claim 25.

The Examiner further asserts that Marrs’ invention “inherently possesses any structural characteristics imparted by the process limitation,” specifically the characteristic of reduced lead inductance, and cites to *In re Fitzgerald, Sanders, and Begheri*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980), for support of this proposition. (Office Action, pg. 11.) *In re Fitzgerald*, however, also states that the applicants invention must be “identical with or only slightly different” from the prior art. *In re Fitzgerald*, 619 F.2d at 70. Because Marrs neither expressly nor inherently discloses either a heat sink with a second portion projecting away from a first portion of the heat sink or a heat sink coupled to one of a signal voltage and a reference voltage for the heat sink to operate respectively as a signal plane and a ground plane, the Applicants’ invention is significantly different from that in Marrs. Furthermore, “the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.” *In re Rijkaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993); M.P.E.P. §2112. The evidence to which the examiner cites merely suggests the possibility that the characteristic of reduced lead inductance is present in Marrs; the

examiner does not, and can not, show that the characteristic is *necessarily* present in Marrs. (Office Action, pg. 11-12.) Because the characteristic of reduced lead inductance is not necessarily present in Marrs, claims 1, 22, 24, and 25 are allowable under 35 U.S.C. §§ 102 – 103.

Turning to the rejection of claims 1, 2, 4, 6, 8 through 12, 14 through 20, 24 through 27, 29, 31, 33 through 37 and 39 through 45 are rejected as being obvious over Marrs under 35 U.S.C. § 103. Applicants assert that the presently claimed inventions of presently amended independent claims 1, 22, 24, and 25 clearly distinguish over Marrs.

Applicants further assert that to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest *all* of the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure.

Applicants assert that Marrs fails to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the presently claimed inventions of previously amended independent claims 1, 22, 24, and 25 because Marrs does not, at the very least, teach or suggest all of the claim limitations and does not contain any the suggestion to make the presently claimed inventions and does not contain any reasonable expectation of success for any modification to Marrs for the presently claimed inventions.

Applicants assert that Marrs fails to teach or suggest the claim limitations of the presently claimed inventions of presently amended independent claim 1 calling for “an integrated circuit die positioned within the package body; a lead frame including a plurality of leads having portions enclosed within the package body that connect to the integrated circuit die, the plurality of leads having portions enclosed within the package body forming an area; and an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the

enclosed portion of the at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body and with a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink projecting away from the first portion of the heat sink under the die-attach area and the integrated circuit die, the heat sink coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a signal plane and a ground plane for the plurality of leads of the lead frame.*”

In contrast to the presently claimed inventions, Marrs does not teach or suggest the claimed limitations of “a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink projecting away from the first portion of the heat sink.” Marrs teaches or suggests a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs teaches or suggests a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither teaches nor suggests a second portion projecting away from the first portion of the heat sink. Marrs’ description of a locking moat region is in *direct contrast* with Applicants’ invention of a heat sink with “a second portion ...projecting away from the first portion of the heat sink,” which “locks the heat sink 28 firmly in place” within the package body. (Application, pg. 9.) The Applicants’ invention locks the package body to the heat sink in an entirely different manner than Marrs’ invention. Thus, Marrs does not teach or suggest all of the claim limitations of previously amended independent claim 1.

Furthermore, Marrs fails to teach or suggest the claim limitation of “an electrically conductive heat sink,” which is “coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a single plan and a ground plane.” Marrs’ description teaches that the packaged integrated circuit 200 may be placed on a conductive layer 206, which is sandwiched in between dielectric layers 204 and 208, which are formed around the periphery of the die 101. (Col. 5, lines 34-42.) The Applicants’ invention incorporates a conductive or ground plane property *into the heat sink itself*, not the underlying substrate, for having a different lead inductance during the operation of the integrated circuit die positioned within the package when

compared to that of a conventional, grounded heat sink. Thus, Marrs does not teach or suggest all of the claim limitations of presently amended independent claim 1.

As Marrs fails to teach or suggest all of the claim limitations of previously amended independent claim 1, Applicants submit that claim 1 is not obvious over Marrs under 35 U.S.C. § 103.

Claims 2, 4, 6, 8 through 12, 14 through 20, 26 are each allowable as depending either directly or indirectly from allowable claim 1.

Similarly, Applicants assert that Marrs does not teach or suggest the claim limitation of the presently claimed invention of presently amended independent claim 22 calling for “an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body forming an area and having a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink and the integrated circuit die* for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink.”

Marrs does not teach or suggest “a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink projecting away from the first portion of the heat sink.” Marrs teaches or suggests a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs teaches or suggests a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither teaches nor suggests a second portion projecting away from the first portion of the heat sink. Indeed, the Applicants’ invention locks the package body to the heat sink in an entirely different manner than Marrs’ invention. Thus, Marrs does not teach or describe the claim limitations of previously amended independent claim 22, which is therefore allowable.

Since Marrs fails to teach or suggest the claim limitations of presently amended independent claim 24, Applicants respectfully submits that presently amended independent claim 24 is not obvious over Marrs under 35 U.S.C. § 103.

Independent claim 24 is allowable as Marrs does not teach or suggest the claim limitation of “a vertically extending columnar portion surrounded by a horizontally extending skirt portion.” Marrs teaches a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs teaches a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither teaches nor suggests “a vertically extending columnar portion surrounded by a horizontally extending skirt portion.” Rather, the heat sink in Marrs teaches away from Applicants’ limitation because Marrs’ heat sink does not vary in thickness. (FIGS. 1, 2A, 2B, 4, 8.) Likewise, Marrs’ teaching of a locking moat region is in *direct contrast* with Applicants’ invention of a heat sink with “a vertically extending columnar portion surrounded by a horizontally extending skirt portion,” which “locks the heat sink 88 firmly in place” within the package body. (Application, pg. 9.) The Applicants’ invention locks the package body to the heat sink in an entirely different manner than Marrs’ invention. Since Marrs fails to teach or suggest the claim limitations of previously amended independent claim 24, Applicants respectfully submits that previously amended independent claim 24 is not obvious over Marrs under 35 U.S.C. § 103.

Independent claim 25 is allowable as Marrs does not teach or suggest “an electrically conductive heat sink positioned having a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of an enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame and with a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink, the heat sink coupled to one of a signal voltage and a reference voltage for the heat sink to operate respectively as a signal plane and a ground plane* for the plurality of leads of the lead frame for having a different lead inductance during the operation of

the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink.”

Marrs does not teach or suggest “a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink projecting away from the first portion of the heat sink.” Rather, Marrs teaches a single piece heat sink 110 having a locking moat 112. (FIG. 1.) Each embodiment of Marrs teaches or suggests a variation of a locking moat, *a depressed region within the heat sink* into which the encapsulant flows. (Col. 3, lines 9-12; Col. 3, lines 20 – 33; Col. 3, lines 60-67; Col. 4, lines 1-5; FIGS. 1 – 8.) In addition, Marrs neither teaches nor suggests a second portion projecting away from the first portion of the heat sink. Marrs’ teaching of a locking moat region is in *direct contrast* with Applicants’ invention of a heat sink with “a second portion ...projecting away from the first portion of the heat sink,” which “locks the heat sink 28 firmly in place” within the package body. (Application, pg. 9.) The Applicants’ invention locks the package body to the heat sink in an entirely different manner than Marrs’ invention. Thus, Marrs does not teach or suggest all of the claim limitations of Applicants’ previously amended independent claim 25.

Furthermore, Marrs fails to teach or suggest a “heat sink coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a single plan and a ground plane.” Marrs teaches that the packaged integrated circuit 200 may be placed on a conductive layer 206, which is sandwiched in between dielectric layers 204 and 208, which are formed around the periphery of the die 101. (Col. 5, lines 34-42.) The Applicants’ invention incorporates a conductive or ground plane property *into the heat sink itself*, not the underlying substrate, for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink. Marrs fails to teach or suggest the limitation in Applicants presently claimed invention of a conductive or ground plane property *in the heat sink itself*, not the underlying substrate, for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink. Therefore, as Marrs does not teach or suggest all of the claim limitations of previously amended independent claim 25, claim 25 is allowable.

Applicants assert that claims 26 through 29, 31, 33 through 37, 39 through 45 are each allowable as depending either directly or indirectly from allowable presently amended independent claim 25.

Further, Applicants assert that any rejection of the presently amended independent claims 1, 22, 24, and 25 based upon Marrs under 35 U.S.C. § 103 does not establish a *prima facie* case of obviousness regarding such presently claimed inventions because there is no suggestion in Marrs for any modification thereof to meet all the claim limitations of the presently claimed inventions of presently amended independent claims 1, 22, 24, and 25. Nor can there be any showing of success for any modification of Marrs because Marrs does not teach or suggest all the claim limitations of the presently claimed inventions. Applicants assert that solely Applicants' disclosure can be the basis of any rejection under 35 U.S.C. § 103 regarding the presently claimed inventions of presently amended independent claims 1, 22, 24, and 25. Any such a rejection of the presently claimed inventions under 35 U.S.C. § 103 is neither within the ambit nor the purview of 35 U.S.C. § 103 and, clearly, improper. Therefore, presently amended independent claims 1, 22, 24, and 25 are allowable as well as the dependent claims therefrom.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on Marrs as applied to claims 1, 2, 4 through 6, 8 through 20, 24 through 27, 29 through 31 and 33 through 45, and further in combination with Wark (U.S. Patent 5,696,031)

Claims 3, 22 and 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Marrs as applied to claims 1, 2, 4 through 6, 8 through 20, 24 through 27, 29 through 31 and 33 through 45, and further in combination with Wark (U.S. Patent 5,696,031). Applicants respectfully traverse this rejection, as hereinafter set forth.

Applicants submit that to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest all of

the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure.

Turning again to the cited prior art, Marrs teaches or suggests a packaged integrated circuit including a heat sink with a locking moat. (Col. 5, lines 1-3.) A semiconductor die is attached to a surface of a heat sink using adhesive. (Col. 5, lines 6-8.) Package leads are attached to the heat sink also using adhesive. (Col. 5, lines 15-16.) Using conventional bond wiring methods the bond wires are extended between the bond pads on the semiconductor die and the heat sink. (Col. 5, lines 18-24.) The die, heat sink, bond wires and inner portions of package leads are encapsulated by molding in encapsulant. (Col. 5, lines 24-28.) The encapsulant fills in the locking moat formed in the heat sink and becomes interlocked with the heat sink. (Col. 5, lines 29-32.) Additionally, Marrs teaches or suggests a packaged semiconductor die or dice including a heat sink with a locking feature that can be used to support one or more generally conductive layers thereon and insulated from the heat sink to provide a ground plane or planes, power plane or planes, or signal routing. (See FIG. 4, Col. 4, Lines 10-13.)

Wark teaches or suggests a device and method for stacking wire-bonded integrated circuit dice on flip-chip bonded integrated circuit dice. In addition, Wark teaches or suggests a multi-chip module which is incorporated into a memory device and forms part of an electronic system that includes an input device, an output device, and a processor. The multi-chip module may be incorporated into any of the devices in the module. (Col. 5, lines 59-65.)

Applicants respectfully submit that that any combination of Marrs and Wark fail to teach or suggest the claim limitations of presently amended independent claims 1, 22, and 25 calling for "an integrated circuit die positioned within the package body; a lead frame including a plurality of leads having portions enclosed within the package body that connect to the integrated circuit die, the plurality of leads having portions enclosed within the package body forming an area; and an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of the at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body and with a

die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink projecting away from the first portion of the heat sink under the die-attach area and the integrated circuit die, the heat sink coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a signal plane and a ground plane for the plurality of leads of the lead frame,” “an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body forming an area and having a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink and the integrated circuit die* for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink,” and “an electrically conductive heat sink positioned having a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of an enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame and with a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, *a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink, the heat sink coupled to one of a signal voltage and a reference voltage for the heat sink to operate respectively as a signal plane and a ground plane for the plurality of leads of the lead frame* for having a different lead inductance during the operation of the integrated circuit die positioned within the package when compared to that of a conventional, grounded heat sink.”

Further, in contrast to the presently claimed inventions of presently amended independent claims 1, 22, and 25, Applicants assert that Marrs teaches or suggests a one-piece heat sink construction as discussed above which is clearly not the Applicants presently claimed inventions. Wark teaches or suggests stacking the integrated circuit dice to achieve greater component density in the construction of an electronic system.

Applicants submit that the references themselves teach away from any proposed combination thereof and cannot establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the presently claimed invention of presently previously amended independent claim 25 since Marrs teaches or suggests preventing delamination of the encapsulating material. Wark teaches away from mounting integrated circuit devices on heat sinks, since stacking would prevent the heat sinks from operating effectively and would transfer heat to the lower component in the stack. Applicants assert that it would not be obvious to combine a method for stacking heat generating integrated circuit devices (Wark) with a method of interlocking encapsulant with a heat sink of Marrs since to do so would destroy the invention of Marrs.

Accordingly, for the reasons herein, Applicants assert that any combination of Marrs and Wark cannot and does not establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed inventions and claims 1, 22, and 25 are allowable

Claims 3 and 28 are each allowable as depending, either directly or indirectly from allowable presently amended claims 1 and 25 respectively.

Applicants request entry of this amendment for the following reasons:

The amendment is timely filed as the sixty day response period fell on August 15, 2004, a Sunday.

The amendment places the application in condition for allowance.

The amendment does not require any further search or consideration.

In summary, Applicants submit that claims 1 through 4, 6 through 12, 14 through 29, 31 through 37 and 39 through 45 are clearly allowable over the cited prior art.

Applicants request the entry of this amendment, the allowance of claims 1 through 4, 6 through 12, 14 through 29, 31 through 37 and 39 through 45 and the case passed for issue.

Respectfully submitted,



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